Does Introduction of Bureaucratic Competition Reduce Corruption in Public Service Delivery?

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Does Introduction of Bureaucratic Competition Reduce Corruption in Public Service Delivery?♣

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Abstract

The paper theoretically explores the impact of introducing bureaucratic competition on corruption. For this purpose it considers three different measures of corruption such as corruption incidence (CI), relative corruption incidence (CRI) and corruption rents (CR) in two different types of economies namely corruption-tolerant economies and corruption-reliant economies. As it compares both intensive margin (i.e. the magnitude of bribe) and extensive margin (i.e. the number of bribe incident) of corruption with and without bureaucratic competition, it turns out that as traditionally perceived the introduction of bureaucratic corruption does not necessarily reduce corruption in an economy. The outcome depends on the type of the economy that has been studied, the measure of corruption being used and the initial level of corruption in the economy. Among the counterintuitive results, we find that in a corruption-tolerant economy going by the CI measure, corruption is always higher under competitive regime compared to monopoly regime. The same holds true if the CR measure is used in such economies with sufficiently high share of corrupt officials. In a reliant economy, if CRI measure is applied, corruption is more in competitive regime.

***JEL Classification*:** D73, K42.

***Keywords*:** Corruption, competition, bureaucracy, red tape, measures of corruption, extortion, collusion.

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1. Introduction

It is well known in economic theory that competition improves the functioning of the private sector. However whether the same holds true for the public sector, especially in delivery of public goods/services, is an interesting research question. As far as the corrupt bureaucracies are concerned, the conventional theories suggest, if competition is introduced among bureaucrats for delivery of public goods and services, corruption falls (Becker and Stigler (1974), Rose Ackerman (1978), Shleifer andVishny (1993)). The competing bureaucrats, who supply substitute products, would gradually lower their bribe demands and eventually corruption would disappear. But the recent theory (Drugov (2010)) points out that the change in intensive margin of bribes is not the only outcome of bureaucratic competition as the conventional theory suggests. The extensive margin can also change as the number of bribe transactions may itself get affected by such competition. The paper shows that once the change in extensive margin is taken into account alongside the change in the intensive margin, according to some of the measures of corruption, the conventional wisdom about the impact of introducing competition in a corrupt bureaucracy may change: corruption may in fact rise in some economies.

The paper adapts Drugov (2010) framework to compare two alternative bureaucratic regimes: monopoly and competition. As the bureaucracy moves from monopoly to competitive regime we argue that the bribe rate definitely falls as suggested by the conventional theory, but the lower bribe rate also implies lower deterrent power of bribes in discouraging occurrence of bribe transactions. As the cost of participation in bribe transactions fall, the number of bribe transactions increases. Thus a change in intensive margin induces a change in extensive margin as well. Drugov (2010) uses his model for welfare comparison under the two regimes and concludes that in presence of corruption the welfare of an economy may not necessarily improve on introduction of bureaucratic competition[1]. But he does not compare the level of corruption under the two regimes, as we do it in this paper. Here we try to fill this gap.

In addressing the research question the next step would be to define a measure of corruption. Here we follow Mendez and Sepulveda (2009). They define three different measures of corruption: Incidence of Corruption (CI), Relative Corruption Incidence (CRI) and Corruption Rents (CR) in two different types of economies: corruption-tolerant economies and corruption-reliant economies. While the CI measures the number of times a bribe transaction is observed; the CRI measures the ratio of bribe transactions relative to the total number of transactions; the CR measures the total amount of rents collected by dishonest public officials from bribe transactions. While the corruption-tolerant

[1] In contrast Ahlin and Bose (2006) consider a partially honest bureaucracy where bureaucratic competition for sure leads to greater inefficiencies through delay and misallocation. Earlier while exploring the effect of product market competition on bribe rate Bliss and Di Tella (1997) considered the determination of extensive margin at the equilibrium.

economy is the one where firms are extorted to pay bribes, the corruption-reliant economy is the one where bribes are Pareto improving side contracts. Mendez and Sepulveda study a search theoretic model with a continuum of infinitely lived agents with entrepreneurial abilities. If an agent decides to become an entrepreneur, she needs to incur an investment cost and has to get her project certified by the government. In order to get the certificate, she needs to follow certain regulations which are also costly. The certificate is provided by government bureaucrats who can be corrupt. Honest officials will give the certificate only if the regulations have been followed and they do not charge a bribe and corrupt officials will certify any agent, regardless of the regulations, in exchange for a bribe. The bribe has been determined through Nash Bargaining. Mendez and Sepulveda compare the corruption levels across the corruption tolerant and reliant economies, using CI, CRI and CR for two specific types of parametric changes: change in number of honest bureaucrats and the change in compliance cost. In this paper we use the measures defined by Mendez and Sepulveda to compare a monopoly regime of bureaucracy with a competitive regime of bureaucracy in terms of corruption[2].

The current paper in effect marries Drugov's model of bureaucratic competition with the measures of corruption used by Mendez and Sepulveda to derive its conclusions. In Drugov (2010)a firm can either use an old polluting technology for production which generates negative externality to the society in the form of pollution, or they can invest in a clean technology. As per legislation, only the firms investing in the clean technology are qualified to produce. The investment in clean technology is costly. There are both honest and corrupt bureaucrats in the system, the identity of whom is not disclosed to the firms unless they meet an official. The honest bureaucrats grant licenses only to qualified firms and do not charge a bribe, but the corrupt bureaucrats will grant license to any firm in exchange for a bribe. The bribe is determined through Nash Bargaining. Under monopoly regime, a single bureaucrat administers the license and the firms do not have choice to avoid her. Thus,a corrupt official,having full authority to refuse an applicant, charges the same amount of bribe to both qualified and unqualified firms. In both the regimes, the firms can reapply for the license in the next period if they are refused in the first period. However, while under monopoly regime the firms have to reapply to the same official; under competitive regime firms have choice: they can randomly choose an official to reapply in the next period. The reapplication is costly. However it increases the bargaining power of the firms with the corrupt officials and reduces the bribe amount: the qualified and the unqualified firms pay different bribe amounts. Under monopoly regime, the firms choose from two different strategies: they can either be qualified from period one itself, or they can initially remain unqualified and decide to invest later once the official they meet turns out to be honest. However under competitive regime, firms can have three different strategies; (i) Never invest, (ii) Invest in period one and (iii) Invest once an honest official is met. Following Drugov (2010) we consider all of the above strategies under both the regimes and characterize the profile of bribes. As we compare both the intensive margin (i.e. the magnitude of bribe) and the extensive margin (i.e. the number of bribe incident) under the regimes with and without bureaucratic competition, we find that as

[2]Foster, Horowitz and Mendez (2013) provide axiomatic foundation of these measures. The papers like Cadot (1987), Mookherjee and Png (1995), Bliss and Di Tella (1997), Guriev (2004), Barron and Olken (2009) use one of these measures of corruption.

traditionally perceived we cannot necessarily conclude that introduction of bureaucratic competition reduce corruption in an economy. The outcome depends on the type of the economy that has been studied, the measure[3] of corruption being used and the initial level of corruption in the economy. Some of the results we derive are consistent with the traditional corruption literature; however, some of them are counterintuitive. Among the counterintuitive results, we find that in a corruption tolerant economy going by the CI measure, corruption is always higher under competitive regime compared to monopoly regime. The same holds true if the CR measure is used in such economies with sufficiently high share of corrupt officials. In a reliant economy, if CRI measure is applied, corruption is more in competitive regime.

The distinction we have drawn in this paper between corruption-tolerant economy and corruption-reliant economy can be interpreted on the basis of extortion and collusion. A corruption tolerant economy is the one where firms are victims of extortion and a corruption-reliant economy is the one where firms engage in mutually gainful collusion by "buying" the license from the officials. In the cross country comparison of corruption (Svensson (2005), Shabbir and Anwar (2007)) usually the less developed economies are more or less identified with the corruption tolerant economies (since the majority of corruption incidence is of extortion) and the developed economies are identified with the corruption reliant economies (since the majority of corruption incidence is of collusion). The results obtained in the paper, as mentioned above, suggests that the introduction of bureaucratic competition is likely to invite more corruption in developing economies; going by certain measures like CRI it is likely to increase in the developed economies as well. The results would also apply to certain government departments depending on whether extortion or collusion prevails in them. Therefore the results go completely against the usual policy rhetoric. If control of corruption is the sole objective of introducing competition in a bureaucracy, the current paper sounds a caution.

The next section presents the model and derives the results, followed by the concluding section.

2. The Model

There is a continuum of firms who need a license to produce and the license is provided by some government officials. The firms can use either a new and clean technology or an old polluting one. As per legislation, firms investing in the clean technology are eligible for a license and are thus *qualified* and firms using the old technology are not eligible for the license and are thus *unqualified*. We use the superscripts q and u to denote qualified and unqualified firms, respectively. A firm becomes qualified by investing in clean technology at a cost C. The *i*th firm will invest in the clean technology if $C \leq R_i$ where R_i denotes revenue of the ith firm. The pdf of the firms' revenue is

[3] Escresa and Picci use Public Administration Corruption Index to show that corruption level of a certain country is not reflected by its firms bribing officials abroad. It is the spatial distribution of such cases with respect to the nationalities of the officials that reveal the relative level of corruption abroad.

denoted by $g(R_i)$. If a firm produces being unqualified, it generates a negative externality in the form of pollution.

The government officials are supposed to grant licenses only to qualified firms. The share of honest official is h and these officials give license only to firms who are qualified without charging a bribe. The rest (with share $(1-h)$) is corrupt. A corrupt official will give license to any firm, regardless of their eligibility, in exchange for a bribe. This introduces possibilities of both extortion (qualified firms paying bribe) and collusion (unqualified firms getting the license in exchange for a bribe) in the model.

Following Drugov (2010) we consider two different types of bureaucratic regime: monopoly and competition. Under the monopoly regime, there is a single official and so each firm applies to the same official for a license. Under competitive regime, there are multiple officials and each firm can choose to apply randomly to an official and if refused, it can reapply to the same official or a separate official chosen at random. Firms are only aware of the probabilities of the kind of official; their exact identities are revealed once the firms interact with the officials. We assume both the firms and the corrupt officials are risk neutral. In both the regimes, corrupt officials ask for a bribe b which is determined through Nash Bargaining, with the firm and the official equally splitting the surplus from the relationships. Since under monopoly regime, a single bureaucrat administers the delivery of license, she has full authority to refuse an applicant and thus will charge the highest bribe amount. Under competition since multiple bureaucrats administer the delivery of licenses, firms have outside option. This along with the possibility of reapplication becomes the twin reasons to increase the bargaining power of the firms against the corrupt officials. This leads to a lower bribe charged under competitive regime compared to monopoly regime. We use the subscripts c and m in relevant variables to denote competition and monopoly regimes respectively.

The timeline of the game between the firms and the officials are as follows. There is an infinite horizon and a common discount factor ð among the firms which is used as the costs of their reapplication. Initially all the firms are unqualified. At the beginning of each period, a firm decides whether to invest or not to invest. A firm, which invests once, remains qualified forever. The firm then applies to an official for a license. If the firm gets the license, it produces and earns profit π and quits the game, otherwise it reapplies in the next period. Under monopoly, the firms will reapply to the same official and in competition the firm can reapply to the same official or a different official chosen at random. The bribes demanded by the corrupt officials are considered as pure transfers. Let us now consider the two regimes in detail.

2.1 Monopoly Regime

Under the monopoly regime while applying for the license the firms cannot switch from one official to another. The monopoly official, if corrupt, charges the same amount of bribe from both qualified and unqualified firms determined through Nash Bargaining which is half the bribe surplus R_i. Thus, any firm in monopoly, if required to pay a bribe, pays half of its revenue as bribe. The bribe for qualified and unqualified firms in monopoly regime is denoted by b_m^q and b_m^u respectively.

Observation1: [*Drugov*(2010)]$b_m^q = b_m^u = b_m = \frac{1}{2}R_i$.

Proof: Since both officials and agents are risk neutral, in the Nash bargaining solution the following must be true:

$$R_i - b_m = b_m - 0$$

which implies:

$b_m = \frac{1}{2}R_i$.

Thus, any firm in monopoly, if required to pay a bribe, pays half of its revenue as bribe. Anticipating this, a firm under monopoly regime can adopt two different strategies. It can either choose to be initially unqualified and or it can wait to invest and become qualified in period one. The expected profit of the qualified firm is:

$\pi_m^q = hR_i + (1-h)\frac{1}{2}R_i - C$. (1)

Initially if the firm decides to remain unqualified, the only way it gets the license in this regime is that it meets a corrupt official and pays bribe for the license. Otherwise, the official it meets is an honest one. Then it knows that for receiving the license it has no other alternative than investing in clean technology and reapplying to the same official in the next period. Therefore the expected profit of the initially unqualified firm is given by:

Under monopoly regime a firm decides to be qualified if and only if $\pi_m^q - \pi_m^u \geq 0$ i.e. $Ri \geq R_1^m$where $R_1^m = \frac{C(1-\delta h)}{h(1-\delta)}$.On the other hand an unqualified firm under monopoly regime produces if and only if $\pi_m^u \geq 0$. Substituting from (2) for π_m^u , $\pi_m^u \geq 0$ implies $R_i \geq R_2^m$where $R_2^m = \frac{2\delta hc}{h(2\delta-1)+1}$.

Observation 2:$R_1^m > R_2^m$.

Proof: $R_1^m - R_2^m = \frac{C(1-h)(1+\delta h)}{h(1-\delta)(1-h+2\delta h)}$. (2)

Since $\delta < 1$and $h < 1$, $R_1^m - R_2^m > 0$. □

Observation 2 shows that since investment is costly, the qualified firms investing in period one itself must have higher revenue compared to firms who remain initially unqualified.

We shall now summarize the monopoly regime equilibrium as:

If $R_2^m > 0$ firms having their revenue in [0, R_2^m), do not enter the industry. The firms in $[R_2^m, R_1^m)$ are unqualified initially, but invest and become qualified if the official they meet while applying turns out as honest; and firms in $[R_1^m, \propto)$, invest and become qualified in period one itself. All firms in $[R_2^m, \propto)$ pay bribe of amount $\frac{1}{2}R_i$if they meet a corrupt official.

2.2 Competitive Regime

In the competitive regime, once denied, a firm may subsequently access another official for the license. So now it has an outside option. In this situation if an unqualified firm meets an honest official and gets denied of the license, it may decide to remain unqualified and reapply to some other official chosen randomly in the next period. It may continue doing so till it meets a corrupt official. Since firms under competitive regime have outside option, they have greater bargaining power against a corrupt official in bribe negotiation. Now firms have three mutually exclusive strategies: (1) invest in period one (to be qualified); (2) never invest (to remain unqualified); and (3) invest (to be qualified) once an honest official is met. Which one of these will be chosen? To find an answer let us consider these strategies separately in detail.

Strategy 1: Invest in period one

In this case, a firm invests and becomes qualified in period one itself. If the firm meets an honest official definitely gets the license without paying a bribe. However it may also meet a corrupt official and face a demand for bribe. In such a situation, given the outside option, now it can refuse to pay the bribe and reapply in the subsequent periods until it meets an honest official. However this increases the reapplication costs which has been modelled here as the cost of delay: the payoff reduces by the discount factor $\delta \in (0,1)$ in the subsequent period. Therefore, a qualified firm that wishes to avoid these costs will agree to pay bribe b_c^q to the corrupt official whom it may meet in period 2 itself and will obtain the license. So, in competitive regime as well, there exists a case of extortion. The expected profit of a qualified firm becomes:

$$\pi_c^q = hRi + (1-h)\left(R_i - b_c^q\right) - C. \quad (3)$$

Strategy 2: Never invest

A firm following this strategy decides never to invest and remains unqualified forever. Thus its only source of license is a corrupt official. If in period 2, such a firm meets an honest official, it will go on reapplying in the next period, until it finds a corrupt official. Once it meets a corrupt official, it pays the bribe b_c^u to get the license. The expected profit of an unqualified firm thus becomes:

$$\pi_c^u = \delta h \pi_c^u + (1-h)(R_i - b_c^u)\ . \quad (4)$$

Strategy 3: Invest once an honest official is met

If a firm that is initially unqualified meets an honest official in period two, the official will not grant the license. However, in this case, the firm will invest in the clean technology and reapply next period to the same honest official so that it gets the license without a bribe for sure. If the firm in period one meets a corrupt official, he will pay the bribe b_c^{uq} and get the license. Note that this behaviour of the firm is identical as that of a firm under monopoly regime, which remains initially unqualified and meets an honest official. The expected profit of a firm adopting this strategy is thus:

$$\pi_c^{uq} = \delta h(Ri - C) + (1-h)\left(R_i - b_c^{uq}\right). \quad (5)$$

Observation 3: [*Drugov*(2010)]

(i)$b_c^q = \frac{R_i(1-\delta)}{2-\delta+\delta h}$, $b_c^u = \frac{R_i(1-\delta)}{2-\delta-\delta h}$and $b_c^{uq} = \frac{R_i-\delta^2 h(Ri-C)-\delta R_i(1-h)}{2-\delta+\delta h}$;

(ii) $b_c^q \leq b_c^{uq} \leq b_c^u \leq b_m$.

Proof: Since both officials and agents are risk neutral, following each of the strategies mentioned above, in order to decide the bribe rate in the Nash bargaining solution the firm and the corrupt official equally split the bribe surplus between them.

For firms investing in period 1, since the firm may refuse to pay bribe and reapply in the next period, the agreement payoff is $R_i - \delta(\pi_c^q + C)$. Then at the Nash bargaining solution the following must hold:

$$b_c^q - 0 = R_i - \delta\pi_c^q - \delta C - b_c^q$$

which in turn implies:

$b_c^q = \frac{R_i - \delta\pi_c^q - \delta C}{2}$.

Substituting π_c^q from (3) and simplifying we get: $b_c^q = \frac{R_i(1-\delta)}{2-\delta+\delta h}$

If a firm that never invests meets an honest official, it will go on reapplying until it meets a corrupt official since the latter is the firm's only source of license. At the Nash bargaining solution it must be that b_c^u satisfies:

$b_c^u - 0 = R_i - \delta\pi_c^u - b_c^u$.

Substituting π_c^u from (4) in the equation above and simplifying we obtain:

$b_c^u = \frac{R_i(1-\delta)}{2-\delta-\delta h}$.

For a firm that invests if it meets an honest official, the Nash bargaining solution which decidesb_c^{uq} must satisfy:

$b_c^{uq} - 0 = R_i - \delta\pi_c^{uq} - b_c^{uq}$.

Substituting π_c^{uq} from (5) and simplifying we get: $b_c^{uq} = \frac{R_i - \delta^2 h(R_i - C) - \delta R_i(1-h)}{2-\delta+\delta h}$.

The statement of (ii) follows from comparison of b_c^q , b_c^{uq} , $b_c^u$and b_m. □

The bribe amount in the bribery game in period 2 depends on relative bargaining strength of the parties involved. Under monopoly regime the bargaining power of a firm in the bribery game is lower than that in the competitive regime because it cannot dispense with the official. Under competitive regime, however, once refused the firms have outside option of applying to a second official. A firm which follows the strategy of never investing has the least and a firm which invests in period one itself has the greatest bargaining power against a corrupt official in this regime. The firm which follows the strategy of 'invest once an honest official is met' has its bargaining power between these two extremes.

Substituting the values of b_c^q , $b_c^{uq}$and b_c^u in equations (3), (4) and (5) respectively we calculate π_c^q, π_c^u and π_c^{uq}. It turns out that for all values of $R_i \geq 0$, $\pi_c^u \geq 0$. So unlike the monopoly regime, where if $R_2^m > 0$ firms having their revenue in [0, R_2^m) do not enter the industry, here all the firms enter irresepective of their revenue potential. A firm invests in period 1 itself if and only if$\pi_c^q -$

$\pi_c^{uq} \geq 0$ implying$R_i \geq R_1^c$where $R_1^c = \frac{C[(2-\delta(1+h)]}{2h(1-\delta)} > 0$. Thus R_1^c is the revenue threshold, below which a firm under competitive regime will not invest in period 1. Similarly if$\pi_c^{uq} - \pi_c^u \geq 0$a firm under competitive regime is initially unqualified and invests once it meets an honest official. Note this happens for all firms having$R_i \geq R_2^c$where $R_2^c = \frac{C(2-\delta-\delta h)}{(1+h)(1-\delta)} > 0$.

Observation 4:$R_1^c > R_2^c$.

Proof: $R_1^c - R_2^c$=$\frac{C(1-h)[2-\delta(1+h)]}{2h(1-\delta)(1+h)}$. (6)

First note since, $\delta < 1$,$2 - \delta(1 + h) > 0$, the denominator on the RHS of (6) is positive. In the numerator since $0 < h < 1$and $\delta < 1$,$2 > \frac{\delta(1-\delta h)}{1-h} > 0$ and the statement of the observation follows.

Observation 4, like observation 2, shows that since investment is costly, firms investing in period one under competitive regime has higher revenue compared to the rest. Using the discussion above and observation 4 we shall now summarize the features of competitive regime equilibrium as:

Under competitive regime all firms with $R_i \geq 0$ enters the market to produce.The firms having their revenue in [0, R_2^c) never invest in clean technology. The firms in $[R_2^c, R_1^c)$ invest and become qualified if honest official is met, and the firms in $[R_1^c, \propto)$ invest to be qualified in period one itself. All firms in $[0, \propto)$ pay bribe if met with a corrupt official. However, qualified and unqualified firms under competitive regime pay different bribe amounts.

2.3 Comparison of the Regimes

Observation 5:$R_1^m > R_1^c$.

Proof:$R_1^m - R_1^c = \frac{\delta C(1-h)}{2h(1-\delta)}$.

Since $0 < h < 1, \delta < 1$, the statement of the observation follows. □

Observation 6:$R_2^m < R_2^c$.

Proof:$R_2^m - R_2^c = \frac{2\delta hC(1+h)(1-\delta) - C(2-\delta-\delta h)[h(2\delta-1)+1]}{[h(2\delta-1)+1](1+h)(1-\delta)}$. (7)

Case 1

Suppose $h < \frac{1}{1-2\delta}$. Then $[h(2\delta - 1) + 1] > 0$. Since $\delta < 1$ the denominator of RHS of (7) is positive.

Let us now consider the numerator of RHS of (7) which can be written as:

$X(h) = -C[\delta\{h(2 - h) - 1\} + 2(1 - h)]$.

Since $\frac{2(1-h)}{[1-h(2-h)]} > 2 > \delta$, $[\delta\{h(2 - h) - 1\} + 2(1 - h)] > 0$ and $X(h) < 0$ for all values of h in $(0, 1)$. Therefore the statement of the observation follows.

Case 2

Suppose $h > \frac{1}{1-2\delta}$. Then $[h(2\delta - 1) + 1] < 0$. Since $\delta < 1$ the denominator of RHS of (7) is negative.But now since $(2 - \delta(1 + h)) > 0$ the numerator of RHS of (7) is positive. Therefore the RHS of (7) is negative and the statement of the observation follows. □

Using observations 2, 4, 5 and 6 in figure 1 below we compare the revenue thresholds under the two regimes:

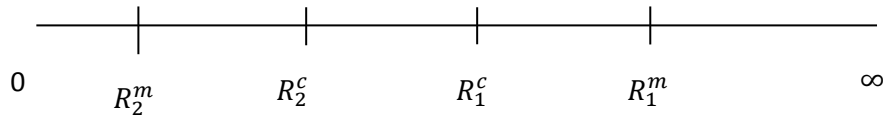

Figure 1: Comparison of revenue thresholds in monopoly and competitive regimes

From observations 3 and figure 1 above it follows that the qualified firms under competitive regime pays lower amount of bribe, but since $R_1^m > R_1^c$ the number of firms paying such extortion money increases under the competitive regime. Similarly if $R_2^m > 0$ the inefficient firms having their revenue in [0, R_2^m) do not enter the industry and therefore they do not pay bribe. But in the competitive regime the same firms would enter the market and would remain unqualified forever to get the license through collusive bribe with the corrupt officials. However the bribe amount falls for the unqualified firms in the competitive regime. So as we move from monopoly regime to a competitive regime of bureaucracy both the intensive margin and the extensive margin of the corruption equilibrium changes. Now we compare the extent of corruption under the two regimes.

For comparing corruption under the monopoly and competitive regime following Mendez and Sepulveda (2009) we use three different measures as follows:

Corruption Incidence (CI): measures the number of licenses administered through bribes.

Relative Corruption Incidence (CRI): measures the ratio of licenses involving a bribe to the total number of licenses administered.

Total Corruption Rents (CR): measures the total amount of rents collected by dishonest public officials in the form of bribes.

Following Mendez and Sepulveda (2009) we also compare the above measures for two different types of economies: Corruption Tolerant and Corruption Reliant. These economies are defined below.

Corruption Tolerant Economy (T): an economy where qualified firms, who invest in period one itself, are extorted to pay bribes.

Corruption Reliant Economy (R): an economy where unqualified firms in period one, pay bribes.

Using the model developed above, the corruption in the tolerant economy under competitive regime is measured in three alternative ways as:

$$CI_c^T = (1-h)\int_{R_1^c}^{\infty} g(R_i)dR_i; \tag{8}$$

$$CRI_c^T = \frac{(1-h)\int_{R_1^c}^{\infty} g(R_i)dR_i}{\int_{R_1^c}^{\infty} g(R_i)dR_i} = (1-h); \tag{9}$$

and

$$CR_c^T = (1-h)\int_{R_1^c}^{\infty} b_c^q g(R_i)dR_i. \tag{10}$$

The corruption in the tolerant economy under monopoly regime is similarly measured in three alternative ways as:

$$CI_m^T = (1-h)\int_{R_1^m}^{\infty} g(R_i)dR_i; \tag{11}$$

$$CRI_m^T = \frac{(1-h)\int_{R_1^m}^{\infty} g(R_i)dR_i}{\int_{R_1^m}^{\infty} g(R_i)dR_i} = (1-h); \tag{12}$$

and

$$CR_m^T = (1-h)\int_{R_1^m}^{\infty} b_m g(R_i)dR_i. \tag{13}$$

Proceeding similarly, the corruption in the reliant economy under competitive regime is measured in three alternative ways as:

$$CI_c^R = (1-\mathrm{h})\int_0^{R_2^c} g(R_i)dR_i + (1-\mathrm{h})\int_{R_2^c}^{R_1^c} g(Ri)dR_i = (1-\mathrm{h})\int_0^{R_1^c} g(R_i)dR_i\ ; \tag{14}$$

$$CRI_c^R = \frac{(1-h)\int_0^{R_2^c} g(R_i)dR_i + (1-h)\int_{R_2^c}^{R_1^c} g(R_i)dR_i}{(1-h)\int_0^{R_2^c} g(R_i)dR_i + \int_{R_2^c}^{R_1^c} g(R_i)dR_i}\ ; \tag{15}$$

and

$$CR_c^R = (1-h)[\int_0^{R_2^c} b_c^u\ g(R_i)dR_i + \int_{R_2^c}^{R_1^c} b_c^{uq}\ g(R_i)dR_i]\ . \tag{16}$$

The corruption in the reliant economy under monopoly regime is similarly measured in three alternative ways as:

$$CI_m^R = (1-\mathrm{h})\int_{R_2^m}^{R_1^m} g(R_i)dR_i\ ; \tag{17}$$

$$CRI_m^R = \frac{(1-h)\int_{R_2^m}^{R_1^m} g(R_i)dR_i}{\int_{R_2^m}^{R_1^m} g(R_i)dR_i} = (1-h)\ ; \tag{18}$$

and

$$CR_m^R = (1-h)[\int_{R_2^m}^{R_1^m} b_m\ g(R_i)dR_i]\ . \tag{19}$$

We shall now compare the measures of corruption across the two regimes viz. competition and monopoly to check whether introducing bureaucratic competition actually reduces corruption. First we do it for the tolerant economies.

Proposition 1: *In a tolerant economy, according to the CI measure, corruption under the competitive regime is higher compared to the monopoly regime i.e.* $CI_c^T > CI_m^T$.

Proof: From (8) and (11) we obtain:

$$CI_c^T - CI_m^T = = (1-h)[\int_{R_1^c}^{\infty} g(R_i)dR_i - \int_{R_1^m}^{\infty} g(R_i)dR_i]. \quad (20)$$

Since from observation 6 we have$R_1^m > R_1^c$, it follows that the RHS of equation (20) is positive. Therefore, the statement of the proposition follows. □

Since firms have outside option in competition, firms investing in period one have higher bargaining power against the corrupt officials and the bribe falls: therefore competitive regime provides more *ex ante incentive* to invest in period one. The expansion of extensive margin due to introduction of bureaucratic competition increases the frequency of bribery and intuitively explains proposition 1.

Proposition 2: *In a tolerant economy, according to the CRI measure,corruption level in competitive regime and in the monopoly regime is the same i.e.* $CRI_m^T = CRI_c^T$.

Proof: From (9) and (12) we obtain:

$$CRI_c^T - CRI_m^T = 0.$$

Therefore, the statement of the proposition follows. □

Note a tolerant economy consists of qualified firms who are extorted and only the corrupt officials extort. So, out of the total number of licenses issued in either regime the number of extortion - incidents remain at $(1-h)$ proportion.

Proposition 3: *In a tolerant economy, according to the CR measure,as* $h \to 0$, $CR_c^T > CR_m^T$ *and as* $h \to 1, CR_c^T < CR_m^T$.

Proof: From (10) and (13) we obtain:

$$CR_c^T - CR_m^T = (1-h)[\int_{R_1^c}^{\infty} b_c^q \, g(R_i)dR_i - \int_{R_1^m}^{\infty} b_m \, g(R_i)dR_i \,]. \quad (21)$$

As $h \to 1, CR_c^T - CR_m^T < 0$ and as $h \to 0, CR_c^T - CR_m^T > 0$. Now,

$$\frac{\partial(CR_c^T - CR_m^T)}{\partial h} = -\left[\int_{R_1^c}^{\infty} b_c^q \, g(R_i)dR_i - \int_{R_1^m}^{\infty} b_m \, g(R_i)dR_i\right] + (1-h\left[\lim_{t\to\infty} \frac{\delta t(1-\delta)}{(2-\delta+\delta h)^2} G(t) - \frac{\delta R_1^c(1-\delta)}{(2-\delta+\delta h)^2} G(R_1^c) + g(R_1^c)\frac{\partial R_1^c}{\partial h}\left[\frac{R_1^c(1-\delta)}{2-\delta+\delta h} - \frac{1-\delta}{2-\delta+\delta h}\right] - \frac{\partial R_1^m}{\partial h}\left[\frac{1}{2}G(R_1^m) + \frac{1}{2}R_1^m g(R_1^m) - \frac{1}{2}g(R_1^m)\right]\right].$$

(22)

Assuming that the direct effects of change in h dominate the indirect effects we have:

$$\frac{\partial(CR_c^T - CR_m^T)}{\partial h} \approx -\left[\int_{R_1^c}^{\infty} b_c^q \, g(R_i)dR_i - \int_{R_1^m}^{\infty} b_m \, g(R_i)dR_i\right].$$

As $h \to 1$, both $R_1^c \to C$ and $R_1^m \to C$ and therefore also as $h \to 1$, $[R_1^m - R_1^c] \to 0$. Since $b_m > b_c^q$ (from observation 3 as $b_m > b_c^q$) it follows that

$\int_{R_1^c}^{\infty} b_c^q \, g(R_i) dR_i < \int_{R_1^m}^{\infty} b_m \, g(R_i) dR_i$ as $h \to 1$ and thus we have $\frac{\partial (CR_c^T - CR_m^T)}{\partial h} > 0$ as $h \to 1$.

But as $h \to 0$, $R_1^c \to \infty$ and $R_1^m \to \infty$. Also as $h \to 0$, $[R_1^m - R_1^c] \to \infty$.

Since $\frac{\partial R_1^m}{\partial h} < 0, \frac{\partial R_1^c}{\partial h} < 0$ as $h \to 0$, both R_1^m and R_1^c increases, $[R_1^m - R_1^c]$ increases as well, but the increase is much more for R_1^c compared to R_1^m and hence the difference between R_1^m and R_1^c tends to infinity as $h \to 0$. Therefore as $h \to 0$, even if $b_m > b_c^q$, $\int_{R_1^c}^{\infty} b_c^q \, g(R_i) dR_i > \int_{R_1^m}^{\infty} b_m \, g(R_i) dR_i$ and $\frac{\partial (CR_c^T - CR_m^T)}{\partial h} < 0$.

The fact is that as $h \to 1, CR_c^T - CR_m^T < 0$, $\frac{\partial (CR_c^T - CR_m^T)}{\partial h} > 0$ and as $h \to 0, CR_c^T - CR_m^T > 0$, $\frac{\partial (CR_c^T - CR_m^T)}{\partial h} < 0$, together implies that $[CR_c^T - CR_m^T]$ is a continuous function in $h \in (0,1)$ having a minimum within it and there exists a value of $h = h^*$ at which $CR_c^T = CR_m^T$. Therefore, the statement of the proposition follows. □

Note $\frac{\partial R_1^m}{\partial h} < 0, \frac{\partial R_1^c}{\partial h} < 0$, $\frac{\partial (R_1^m - R_1^c)}{\partial h} < 0$ and $(R_1^m - R_1^c) \to 0$ as $h \to 1$. To start with, suppose $h \to 1$ and extortion is unlikely to occur. Since both $[R_1^m, \propto), [R_1^c, \propto)$ expand and tend to be the same at the limit, the firms investing in period one increase in both the regimes and tends to be the same in count. This happens because the *ex-ante incentive* to invest in period one is now higher and similar in both the regimes. Thus the extensive margin for both regimes tends to be same. Since, b_m is independent of h and b_c^q is decreasing in h, $CR_c^T - CR_m^T < 0$.

As h decreases and tends to 0, both $[R_1^m, \propto), [R_1^c, \propto)$ shrinks but $(R_1^m - R_1^c)$ expands. Hence, firms' investing in period one decrease in both the regimes but the decrease is more in the monopoly regime. This happens because with h tending to 0, though chances of extortion increases in both regimes, its possibility increases under monopoly regime compared to that under competitive regime. So the extensive margin in competition exceeds that of monopoly. Moreover with h tending to 0, the outside option for qualified firms in competition is now lower than before and the qualified firms now have little bargaining power. Thus as h tends to zero, the competitive bribe (b_c^q) increases and moves closer to the monopoly bribe: the intensive margin tends to be same in both the regimes. So based on the difference in extensive margin of the two regimes, rent collected in the form of bribes is relatively higher in competitive regime compared to monopoly regime and hence the statement of observation follows.

Now we compare the corruption measures under the two regimes for the reliant economies.

Proposition 4: *In a reliant economy, according to the CI measure, corruption under the monopoly regime is higher compared to the competitive regime i.e.* $CI_m^R > CI_c^R$.

Proof: From (14) and (17) we obtain:

$$CI_c^R - CI_m^R = (1-h)[\int_0^{R_1^c} g(R_i)dR_i - \int_{R_2^m}^{R_1^m} g(R_i)dR_i\,] \quad (23)$$

and

$$\frac{\partial(CI_c^R - CI_m^R)}{\partial h} = -\left[\int_0^{R_1^c} g(R_i)dR_i - \int_{R_2^m}^{R_1^m} g(R_i)dR_i\right]$$

$$+(1-h)\left[g(R_1^c)\frac{\partial R_1^c}{\partial h} - \{g(R_1^m)\frac{\partial R_1^m}{\partial h} - \left(-g(R_2^m)\frac{\partial R_2^m}{\partial h}\right)\}\right]$$

$$= -\left[\int_0^{R_1^c} g(R_i)dR_i - \int_{R_2^m}^{R_1^m} g(R_i)dR_i\right] + (1-h)\left[g(R_1^c)\frac{\partial R_1^c}{\partial h} - g(R_1^m)\frac{\partial R_1^m}{\partial h} - g(R_2^m)\frac{\partial R_2^m}{\partial h}\right]$$

Assuming that the direct effects of change in h dominate the indirect effects we have:

$$\frac{\partial(CI_c^R - CI_m^R)}{\partial h} \approx -\left[\int_0^{R_1^c} g(R_i)dR_i - \int_{R_2^m}^{R_1^m} g(R_i)dR_i\right]. \quad (24)$$

<u>Case 1</u> $\delta > \frac{1}{2}$

If $\delta > \frac{1}{2}$, it is $h > \frac{1}{1-2\delta}$ for all values of $h \in (0,1)$. From observation 6 we know that if $h > \frac{1}{1-2\delta}$, $R_2^c > R_2^m = 0$. Since from observation 5, $R_1^m > R_1^c$ as $h \to 1$ from (23) it follows that $(CI_c^R - CI_m^R) \to 0$ and as $h \to 0, (CI_c^R - CI_m^R) < 0$. From (24) it is clear that for all values of $h \in (0,1)$ in such a situation $\frac{\partial(CI_c^R - CI_m^R)}{\partial h} > 0$.

Therefore the statement of the proposition follows. □

<u>Case 2</u> $\delta < \frac{1}{2}$

Now although $(1-2\delta) > 0$, it is always $h < \frac{1}{1-2\delta}$.

From observation 6 we know that if $h < \frac{1}{1-2\delta}$, $R_2^c > R_2^m > 0$. Let us define $R_1^m - R_2^m = \frac{C(1-h)(1+\delta h)}{h(1-\delta)(1+2\delta h-h)}$as X. Therefore,

$X - R_1^c = \frac{C[2(1-h)(1+\delta h)-(2-\delta-\delta h)(1-h+2\delta h)]}{2h(1-\delta)(1+2\delta h-h)]}$.

Note as $\delta < 1$ and $0 < h < 1$ the denominator of $(X - R_1^c)$ is positive. The numerator is also positive if $h < \frac{1}{3-2\delta}$ holds, which is always true in this case. Therefore $X - R_1^c > 0$ as $h \to 0$ and from (23), $(CI_c^R - CI_m^R) < 0$.

From (24) it is clear that for all values of $h \in (0,1)$ in such a situation $\frac{\partial(CI_c^R - CI_m^R)}{\partial h} > 0$. Therefore the statement of the proposition follows. □

The absolute frequency of collusive bribery in competitive and monopoly regime is given by $(1-h)\int_0^{R_1^c} g(R_i)dR_i$ and $(1-h)\int_{R_2^m}^{R_1^m} g(R_i)dR_i$ respectively. So for a given value of h, it comes to the

comparison of $[0,R_1^c)$ and $[R_2^m,R_1^m)$.If $R_2^m = 0$, since $R_1^m > R_1^c$ from observation 5, it is obvious that the frequency falls as competition is introduced in the bureaucracy. If $R_2^m > 0$, since $(R_1^m - R_2^m - R_1^c) > 0$, the same result holds. The intuition is the following. Since $\frac{\partial R_1^m}{\partial h} < 0, \frac{\partial R_1^c}{\partial h} < 0, \frac{\partial R_2^m}{\partial h} > 0$, as $h \to 1$, $[0,R_1^c)$ and $[R_2^m,R_1^m)$ shrinks as h increases. This implies that there is a decline in the unqualified firms in both regimes. In a reliant economy as h tends to unity, unqualified firms have lower chances of getting a license through a bribe in both regimes. Thus these firms no longer have incentive to remain unqualified and hence there will be a decline in the number of unqualified firms in both regimes. But due to the availability of outside option in competitive regime, unqualified firms have relatively higher chance of meeting a corrupt official (their source of license) under this regime. Thus under competitive regime unqualified firms have less ex-post incentive to invest. Thus, with h tending to one, the pool of unqualified firms becomes larger in competition compared to monopoly. Thus with the introduction of competition compared to monopoly regime, frequency of corruption rises. The introduction of bureaucratic competition shrinks the extensive margin of collusive bribery between the firms and the corrupt bureaucrats.

Proposition 5:*Ina reliant economy, according to CRI measure, corruption level in competitive regime exceeds corruption level in competitive regime i.e.* $CRI_m^R < CRI_c^R$.

Proof: From (15) and (18) we obtain:

$$CRI_m^R - CRI_c^R = (1-h) - \frac{(1-h)\int_0^{R_2^c} g(R_i)dR_i + (1-h)\int_{R_2^c}^{R_1^c} g(R_i)dR_i}{(1-h)\int_0^{R_2^c} g(Ri)dRi + \int_{R_2^c}^{R_1^c} g(Ri)dRi}$$

$$= (1-h)[1 - \frac{\int_0^{R_2^c} g(R_i)dR_i + \int_{R_2^c}^{R_1^c} g(R_i)dR_i}{(1-h)\int_0^{R_2^c} g(R_i)dR_i + \int_{R_2^c}^{R_1^c} g(R_i)dR_i}].$$

Since $\frac{\int_0^{R_2^c} g(R_i)dR_i + \int_{R_2^c}^{R_1^c} g(R_i)dR_i}{(1-h)\int_0^{R_2^c} g(R_i)dR_i + \int_{R_2^c}^{R_1^c} g(R_i)R_i} > 1, \left[1 - \frac{\int_0^{R_2^c} g(R_i)dR_i + \int_{R_2^c}^{R_1^c} g(R_i)dR_i}{(1-h)\int_0^{R_2^c} g(R_i)dR_i + \int_{R_2^c}^{R_1^c} g(R_i)dR_i}\right] < 0.$

Since $0 < h < 1$ the statement of the proposition follows. □

Intuitively, in competition since the firms have outside option, unlike monopoly firms have a higher incentive to enter the industry. Moreover in a reliant economy, the probability with which an unqualified firm gets a license through collusive bribery is higher in competition compared to in monopoly.

Proposition 6:*Ina reliant economy, according to CR measure, corruption under the monopoly regime is higher compared to the competitive regime i.e.* $CR_m^R > CR_c^R$.

Proof: From (16) and (19) we obtain:

$$CR_c^R - CR_m^R = (1-h)[\int_0^{R_2^c} b_c^u g(R_i)dR_i + \int_{R_2^c}^{R_1^c} b_c^{uq} g(R_i)dR_i - \int_{R_2^m}^{R_1^m} b_m g(R_i)dR_i \,]. \quad (25)$$

and

$$\frac{\partial(CR_c^R - CR_m^R)}{\partial h} = -\left[\int_0^{R_2^c} b_c^u g(R_i)dR_i + \int_{R_2^c}^{R_1^c} b_c^{uq} g(R_i)dR_i - \int_{R_2^m}^{R_1^m} b_m g(R_i)dR_i\right]$$

$$+(1-h)[\int_0^{R_2^c} \frac{\partial b_c^u}{\partial h} g(R_i)dR_i + \int_0^{R_2^c} b_c^u g(R_i)dR_i \frac{\partial R_2^c}{\partial h} + \int_{R_2^c}^{R_1^c} \frac{\partial b_c^{uq}}{\partial h} g(R_i)dR_i + \int_{R_2^c}^{R_1^c} b_c^{uq} g(R_i)dR_i \frac{\partial R_1^c}{\partial h}$$

$$- \int_{R_2^c}^{R_1^c} b_c^{uq} g(R_i)dR_i \frac{\partial R_2^c}{\partial h} - \int_{R_2^m}^{R_1^m} b_m g(R_i)dR_i \frac{\partial R_1^m}{\partial h}$$

$$+\int_{R_2^m}^{R_1^m} b_m g(R_i)dR_i \frac{\partial R_2^m}{\partial h}].$$

Assuming that the direct effects of change in h dominate the indirect effects we have:

$$\frac{\partial(CR_c^R - CR_m^R)}{\partial h} \approx -\left[\int_0^{R_2^c} b_c^u g(R_i)dR_i + \int_{R_2^c}^{R_1^c} b_c^{uq} g(R_i)dR_i - \int_{R_2^m}^{R_1^m} b_m g(R_i)dR_i\right]. \quad (26)$$

Case 1 $\delta > \frac{1}{2}$

If $\delta > \frac{1}{2}$, it is $h > \frac{1}{1-2\delta}$ for all values of $h \in (0,1)$. From observation 6 we know that if $h > \frac{1}{1-2\delta}$, $R_2^c > R_2^m = 0$. As $h \to 1$ from (25) it follows that $(CR_c^R - CR_m^R) \to 0$. What happens to $(CR_c^R - CR_m^R)$as $h \to 0$?

From observation 3 we know that $b_c^q < b_c^{uq} < b_c^u < b_m$. Also from observation 2, 4, 5 and 6 it follows that $R_1^m > R_1^c > R_2^c > R_2^m = 0$. Therefore as $h \to 0$, the RHS of equation (25) tends to a negative number.

Since $\left[\int_0^{R_2^c} b_c^u g(R_i)dR_i + \int_{R_2^c(h)}^{R_1^c} b_c^{uq} g(R_i)dR_i - \int_{R_2^m}^{R_1^m} b_m g(R_i)dR_i\right] < 0$ from (26) it is also clear that for all values of $h \in (0,1)$ in such a situation $\frac{\partial(CR_c^R - CR_m^R)}{\partial h} > 0$.

Therefore the statement of the proposition follows. □

Case 2 $\delta < \frac{1}{2}$

Now although $(1-2\delta) > 0$, it is always $h < \frac{1}{1-2\delta}$.

From observation 6 we know that if $h < \frac{1}{1-2\delta}$, $R_2^c > R_2^m > 0$. So to derive the sign of the term on the RHS of (25) we need to make a comparison of $[R_1^m - R_1^c]$and R_2^m. It turns out that:

$$R_1^m - R_1^c - R_2^m = \frac{2\delta h(1+h)+1-h(2+3h)}{2h(1-\delta)[1-h(1-2\delta)]}. \quad (27)$$

Since $h < \frac{1}{1-2\delta}$,the denominator of the term on the RHS of (27)is positive and since the numerator $[2\delta h(1+h) > 1-h(2+3h)] > 2$, $R_1^m - R_1^c - R_2^m > 0$. Therefore as $h \to 0$ and from (25) $(CR_c^R - CR_m^R) < 0$.

From (26) it is clear that for all values of $h \in (0,1)$ in such a situation $\frac{\partial(CR_c^R - CR_m^R)}{\partial h} > 0$. Therefore the statement of the proposition follows. □

The extensive margin of collusive bribery in monopoly regime is $[R_2^m, R_1^m)$ and in competitive regime it is $[0, R_1^c)$. If $R_2^m = 0$, since $R_1^m > R_1^c$ from observation 5, the extensive margin under monopoly regime would be greater than the extensive margin under competitive regime. Since bribe rate is also higher in the monopoly regime, as competition is introduced corruption rent falls. If $R_2^m > 0$, the extensive margin of the monopoly shrinks. Now the firms having their revenue in $[0, R_2^m)$ do not enter the industry in monopoly regime. However, they would enter the industry in the competitive regime as firms forever remaining unqualified and in order to obtain the license would pay bribe b_c^u to the corrupt officials. On the other hand the firms having their revenue in $[R_1^c, R_1^m)$ pays collusive bribe only under the monopoly regime. Under competitive regime they would invest to be qualified and would not be paying the collusive bribe. The rest of the firms will be paying bribes under both the regimes. Since $R_1^m - R_1^c - R_2^m > 0$, clearly the number of firms that will be paying collusive bribe under the monopoly regime will be greater than the number of firms paying the same under the competitive regime. Since the bribe rate is also higher under the monopoly regime, the corruption rent will be higher in the monopoly regime than in competitive regime. The introduction of competition in the bureaucracy would reduce corruption rent.

3. Conclusions

Introducing competition in a bureaucracy allows consumers to have an outside option of reapplying to another official in delivery of public goods/services if they want. At the policy level the introduction of competition in bureaucracy has long been thought as an antidote to bureaucratic corruption. The paper analyses this issue in a theoretical model following Drugov (2010) where firms interact with officials to obtain pollution certificate in order to be eligible for production. While an honest official does not demand bribe and issues licences only to qualified firms, a corrupt official collects bribe from both qualified and unqualified firms for issuing licenses. As competition is introduced in the bureaucracy the bribe rate falls as now the firms have option of walking out of the bribe negotiation, more firms choose to remain unqualified as they expect to eventually meet a corrupt official to obtain the license.The paper tries to measure the impact of introducing bureaucratic competition on corruption using three different measures of corruption such as corruption incidence, relative corruption incidence and corruption rents in two different types of economies namely corruption-tolerant economies and corruption-reliant economies. As both intensive margin (i.e. the magnitude of bribe) and extensive margin (i.e. the number of bribe incident) are compared under the two regimes of with and without bureaucratic competition, it finds that as traditionally perceived we cannot necessarily conclude that introduction of bureaucratic competition reduces corruption in an economy. The outcome depends on the type of the economy that has been studied, the measure of corruption being used and the initial level of corruption in the economy. In particular, we find that in a corruption tolerant economy going by the corruption incidence measure, corruption is always higher under competitive regime compared to monopoly regime. The same holds true if the corruption rents

measure is used in such economies with sufficiently high share of corrupt officials. In a reliant-economy, if relative corruption incidence measure is applied, corruption is more in competitive regime.

The results derived in the paper have policy implications for both less developed economies and developed economies of the world, as well as individual government departments in these economies. The distinction we have drawn here between a corruption-tolerant economy and a corruption-reliant economy can be interpreted on the basis of extortion and collusion. A corruption tolerant economy is the one where firms are victims of extortion and a corruption-reliant economy is the one where firms engage in mutually gainful collusion by "buying" the license from the officials. In the cross country comparison of corruption usually the less developed economies are more or less identified with the corruption-tolerant economies (since the majority of corruption incidence is of extortion) and the developed economies are identified with the corruption-reliant economies (since the majority of corruption incidence is of collusion). The results obtained in the paper, as mentioned above, suggests that the introduction of bureaucratic competition is likely to invite more corruption in developing economies; going by certain measures like relative corruption incidence it is likely to increase in the developed economies as well. The results would also apply to certain government departments depending on whether extortion or collusion prevails in them. Therefore the results go completely against the usual policy rhetoric. If control of corruption is the sole objective of introducing competition in a bureaucracy, the current paper sounds a caution.

This work can be extended as well. We have analysed here what happens to corruption on introduction of bureaucratic competition in corruption tolerant and corruption-reliant economies. The scope of the present work can be broadened by analysing the consequent effect on welfare of these economies. It would also be interesting to check whether the behaviour of firms and officials change if a punishment strategy is introduced and how would the reactions of firms alter if the type of officials is known to them beforehand. These remain as my future work.

References

Ahlin, C. and Bose, P., 2007. Bribery, Inefficiency, and Bureaucratic delay, *Journal of Development Economics*, 84: 465-486.

Barron, P. and Olken, B., 2009. The Simple Economics of Extortion: Evidence from Trucking in Aceh, *Journal of Political Economy*, 117(3): 217-252.

Bliss, C. and Di Tella, R., 1997. Does Competition Kill Corruption?,*Journal of Political Economy*, 105(5):1001-1023.

Drugov, M.,2010. Competition in Bureaucracy and Corruption, *Journal of Development Economics*, 92(2):107-114.

Foster, J., Horowitz W., and Mendez, F., 2013.An Axiomatic Approach to the Measurement of Corruption**:** Theory and Applications, *World Bank Economic Review,* .26(2): 217-235*.*

Guriev, S., 2004. Red Tape and Corruption, *Journal of Development Economics*, 73(2):489–504.

Mendez, F. and Sepulveda, F. (2009): What Do We Talk About When We Talk About Corruption?,*Journal of Law, Economics and Organization*, .23(3): 493-512.

Mookherjee, D. and Png, I. 1995. Corruptible Law Enforcers: How Should They be Compensated? The *Economic Journal*, 105:145-159.

Becker, G. S. and Stigler, G. J., 1974. Law Enforcement, Malfeasance, and Compensation of Enforcers, *The Journal of Legal Studies,* 3(1): 1-18.

Rose-Ackerman, S., 1978. Corruption: A Study in Political Economy. New York: Academic Press.

Shabbir, G. and Anwar, M., 2007. Determinants of Corruption in Developing Countries, *Hamburg Institute of International Economics Research Programme World Economy,* Research Paper 2-11.

Shleifer, A. and Vishny, R., 1993. Corruption, *The Quarterly Journal of Economics,* 108(3): 599–617.

Svensson, J., 2005. Eight Questions about Corruption, *Journal of Economic Perspectives,* 19(3): 19-42.